

W.D. Williams

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FOURTH ANNUAL GENERAL MEETING AND CONGRESS

This was held in Brisbane during the weekend of May 22-23, 1965.

The Congress was held in the Department of Zoology, University of Queensland, St. Lucia. Proceedings commenced on the Saturday morning with the presentation of a series of papers the substance of which is reported below. Thirty people were present and of these more than twenty were inter-state visitors. These numbers were gratifying in view of the fact that Brisbane is on the periphery of the total limnological circuit. A pleasing feature was the presentation of two papers by botanists. Previous congresses have been weak on the botanical side.

Following the morning session there was an inspection of lung-fish. Lunch was then provided at Emanuel College which was nearby.

In the afternoon two further papers were presented before the commencement of the annual general meeting. During the meeting Dr. Weatherley presented a progress report on the Jindabyne Project which was mentioned in the last number of the Newsletter. The meeting concluded with the election of those officers listed on page 1.

It will be noted that the size of the Committee has been increased by one. This was made possible by an amendment of the constitution so that, in addition to the President, Vice-President, and Secretary-Treasurer, a Committee of at least five but no more than eight members shall be elected.

On the Saturday evening a most enjoyable dinner was held at a Chinese restaurant.

An excursion was held on the Sunday, and main theme of this was the Brisbane City water supply system. It included a visit to the pumping station at the Mount Crosby Weir on the Brisbane River, followed by an inspection of the treatment plant and filters.

Lunch was consumed at Lake Manchester and it was here that an unexpected traffic hazard, in the form of a very stubborn tree, was encountered. This, we believe, was a plot or an ambush specially prepared by the Queensland hosts for the "benefit" of visitors from inter-state.

We are very grateful to Norm Milward for the work he put into organizing the Congress, and for preparing the lunch provided on the excursion. Thanks are also due to the following: Professor Stephen-son for allowing us the use of facilities in the Zoology Department; the University of Queensland for provision of the Saturday luncheon; and the Brisbane City Council for arranging the conducted tours of the pumping station and treatment plant.

A summary of the papers, in order of presentation, follows.

(1) Microbiology of Manganese in Freshwater

by P. A. Tyler,

Botany Department, University of Tasmania,
Hobart, Tas.

Manganese has been recognised as a problem in water supply technology for about 70 years. The usual visible manifestation of the trouble is a deposit, containing some 20 to 50% manganese, which occurs as a lining in tunnels and pipelines conveying the water. The undesirable effects include blocking of small, domestic service pipes, staining of plumbing fixtures, and staining in industrial processes such as laundering, dyeing, paper and textile manufacture. In hydro-electric undertakings it has been less widely recognised as a problem though it is a source of power loss. The nett hydrostatic head, to which the power output at any given turbine velocity is proportional, is reduced by frictional effects on the flow, associated with the pipe-line deposits.

In Tasmania, manganese deposits occur in certain pipelines of the Hydro-Electric Commission, the distribution of deposits being somewhat peculiar. In pipelines associated with Lake King William a deposit builds up to a thickness of 3-7 mm in a short time, and at this density is responsible for substantial head-loss. Pipelines associated with Great Lake, however, have remained practically free of deposit over very many years.

Because of the need to maintain an integrated pattern of power loading a pipeline can be removed from service for inspection only at infrequent intervals. To overcome this difficulty a simple apparatus has been devised in which 50 gallons of lake water are continuously

circulated through a system of glass tubes. Deposition of manganese occurs in these tubes and it has been possible to study the process in the laboratory. It has been shown:

1. By the use of sterilization techniques and metabolic inhibitors, that deposition of manganese is brought about by micro-organisms and that it does not occur in their absence.
2. That the requisite organisms are present in Great Lake but that the level of soluble manganese in the water is too low to allow deposition. Addition of manganous salts to Great Lake water produces a deposit in the tubes. Addition of oxidizing organisms fails to induce deposition unless manganese is also provided.
3. That there is a seasonal or periodic variation in the amount of manganese deposited from Lake King William water and that this is related to variations in the concentration of soluble manganese in the water.

Micro-organisms have been blamed for manganese deposits in many cases in various parts of the world, the evidence being the isolation on selective media of oxidizing organisms from the pipeline deposits. Though this does not offer conclusive proof, the involvement of micro-organisms in very many cases is highly probable. That the Tasmanian deposits are caused by microbial agency has been demonstrated by means of biological inhibition techniques. Similar work elsewhere has shown that micro-organisms play a prominent role in transformations of manganese in soils.

In most reports of manganese deposition in pipelines, the organisms implicated have been "iron bacteria" of the Sphaerotilus group (Chlamydobacteriales). Numerous fungi, and some bacteria, which are capable of oxidizing manganese in synthetic media, have also been reported though the extent of their involvement in deposition is unknown. In Tasmania, the iron bacteria do not play a major part in formation of the deposits. Several diverse micro-organisms have been isolated and are under investigation currently.

The mechanism by which micro-organisms bring about oxidation and deposition of manganese is uncertain. Chemoautotrophy seems an unlikely explanation. They may play a direct role such as

digestion of the organic moiety of organo-metal chelates, or an indirect one such as provision of suitable conditions of pH and Eh through unconnected metabolic processes. This aspect of the problem requires intensive investigation and is currently being studied.

The crux of the manganese problem lies in the mechanism of solution of manganese in the catchment area or in the storage reservoir itself. Again, the extent of microbiological involvement is not clearly known. Direct bacterial leaching of manganese ores has been reported and has been demonstrated experimentally. On the other hand, incidental microbiological activity may play a large part in limnologic solution of manganese by production of anoxia, low redox potentials, high carbon dioxide levels and abundant organic acids. All these factors are known to favour an increase in the amount of soluble manganese in stored water. In view of the lack of stratification in Lake King William, the dark, organic leachates of button-grass (*Gymnoschoenus*) peat, which stain the rivers feeding the lake, may have special significance. Likewise, the differences between Great Lake and Lake King William may be connected with vegetational differences in the catchments. Lake King William and Lake St. Clair (from which the Derwent River flows into Lake King William) are both fed by rivers draining extensive button-grass plains whereas these are absent in the Great Lake catchment. This is reflected in the clear colourless waters of Great Lake and the brown humic ones of Lake King William. However, this problem requires further investigation and will form the subject of future work.

(2) A Simple Apparatus for Determining Osmotic Concentration in Biological Fluids

by A. H. Weatherley

Zoology Department, School of General Studies,
Australian National University

A simple apparatus (a modification of Gross's) for determination of osmotic concentration of small quantities of body fluids of animals was described. Small pieces of plastic catheter tubing or glass electrophoresis tubes are placed in a holder, between crossed polaroids, within a bath of alcohol at about -10°C . The tubes contain solutions of known salinity and unknown biological solutions and are sealed

at the ends; the tube contents have previously been frozen by total immersion in cold alcohol. Tubes in this system all warm up together and so melt in an order (and after an elapsed time) that is inversely related to their salt concentration. By plotting the "time to melting" of the "known" solutions it is a simple matter to compute the osmotic concentrations of "unknowns" in the same series. Advantages are minute quantities of solution required, ease of setting up rapid repeatability.

(3) Physical Limnology of two North Queensland Crater Lakes

by Ian Douglas

Department of Geography, Research School of Pacific Studies,
Australian National University, Canberra, A. C. T.

The Atherton Basalt Province of north-east Queensland is remarkable for the six explosion craters which mark the last phase of volcanic activity. Four of these craters contain lakes.

Lakes Eacham and Barrine are similar in size, shape and situation, and both are of type 12 (explosion craters) described by Hutchinson (1957, p. 26). Lake Barrine Crater is very large for an explosion crater, its width of 1.9 km exceeding the upper limit for the diameter of a known explosion crater of 1.6 km quoted by Hutchinson.

Situated at about 740 metre above sea level, the lakes are in an area of dry cool climate. Intense rainfall during the wet season causes the levels of the lakes to rise up to 3 metre. When these high levels occur Lake Barrine is drained by an outflow stream, and the water of Lake Eacham seeps through the basalt material on the eastern edge of the crater.

The catchment areas of the two lakes are small, extending only as far as the crater rims. The catchment of Lake Barrine is 2.7 times the area of the lake, but that of Lake Eacham is only 1.2 times the lake area. Most of the water supplied to the lakes must fall as direct precipitation on to the lake surface.

The chemical analyses for water samples taken from the surface of the lake are given in Table 1. Lake Barrine has a higher amount of dissolved matter, which would seem to be the result of

greater hardness and a higher sodium content. The supply of solutes from rainfall to Lake Barrine, in terms of volume per unit area of lake surface, is about twice that to Lake Eacham. This greater volume of rainfall-derived solutes entering Lake Barrine may explain the greater concentration of dissolved matter in the water of that lake.

The analysis of 10 rainfall samples collected within 20 km of the lake indicates that three-quarters of the solute content of rainfall is sodium chloride. Thus, although the major contrasts in the sodium content of the lake waters can probably be attributed to the differing volumes of solutes supplied from rainfall, the contrasts in hardness cannot be explained in these terms. The greater amount of calcium in Lake Barrine may reflect the larger catchment in which runoff waters make contact with the soil before entering the lake.

Table 1

	<u>Lake Barrine</u>	<u>Lake Eacham</u>
Width of Crater	1.89 km	0.90 km
Width of Lake	1.35 km	0.65 km
Area of Lake	103.6 ha	53.0 ha
Mean depth of Lake	146.3 m	109.7 m
Height above M. S. L.	731.5 m	746.8 m
Date	Jan. 1965	Dec. 1964
Temperature °C	25.4	27.0
Spec. Cond.	49	37
(corrected to 18°C)		
Hardness (p. p. m.)	19.9	13.5
Chloride "	5.3	4.9
Calcium "	2.7	1.4
Magnesium "	2.2	2.2
Sodium "	5.6	2.4
Potassium "	3.1	1.0
T. D. S. "	38	31

Reference: Hutchinson, G. E. (1957). A Treatise on Limnology, Vol. 1, New York, Wiley, pp. 1015.

(4) Aspects of Respiration in the Queensland Lungfish,
Neoceratodus forsteri (Kreffft)

by G. Grigg

Zoology Dept., University of Queensland,
Brisbane, Queensland

In the respiratory system of the Queensland Lungfish, gills and a lung are both well developed. The choanae play no part in intake of air or water, the mouth being always open during respiration. The lung is well vascularised and divided into saccular compartments. On this basis it has been assumed that the lung is a functional one. Sections of an injected lung show that the capillaries are closely in contact with the air space to allow gaseous exchange. Furthermore analyses of gas expired from the lung consistently showed depletion of oxygen relative to the atmosphere. The lowest reading obtained was 8% O₂, compared with 21% in the atmosphere.

It has proved interesting to consider the functional advantage conferred by the presence of a lung. Previously it had always been assumed that in times of drought, water in the habitat became stagnant and provided a respiratory problem which Neoceratodus could overcome by resorting to the use of its lung.

Examination of the habitat (Mary and Burnett Rivers) in drought conditions showed no evidence of stagnancy. In fact oxygen supersaturation was frequently encountered, and pH sufficiently high to prevent any free carbon dioxide. It can be assumed that the abundance of plant growth and relatively shallow water subject to wind circulation provide a healthy habitat even if the flow in the waterholes which the fish inhabit becomes negligible. It would seem unlikely therefore that respiratory difficulties are encountered frequently enough to provide selection for maintenance of the lung. Furthermore, the oxygen consumption of Neoceratodus is very low indeed compared with teleost fish and one would expect on this basis alone that Neoceratodus would be less likely to suffer from oxygen shortage if this were present.

It has been reported that Neoceratodus is largely nocturnal, and observations with a simple activity meter confirmed this. Furthermore, it is well documented that the grunting noise which often accompanies the surfacing of Neoceratodus for air, is heard more fre-

quently at night. Correlation of these two observations suggested a hypothesis - that the lung is an accessory respiratory organ utilised during periods of activity.

Respirometry of juvenile (respirometer-sized) fish was used to test this hypothesis. The fish were activated within the respirometer vessel and oxygen consumption measured under two conditions - when allowed to surface for air, and when prevented by a barrier from doing so. Results showed that the fish could maintain a higher oxygen consumption (approx. 0.07 ml/gm/hr) when allowed to surface than when prevented from surfacing (approx. 0.05 ml/gm/hr). In addition, the rate of gill pumping when the fish were allowed to surface was about 67 beats per minute, whereas when prevented from surfacing, the rate rose to 80 beats per minute, although the oxygen consumption was lower than in the former case. These considerations illustrate the restriction placed on the fish by gills alone, and show that with assistance from the lung the fish can respond more vigorously to a stimulus. So it would seem that the lung is an accessory respiratory organ useful during active periods.

The evolution of such a system where gills are supplemented by a lung is worth consideration. It cannot be assumed that the easier availability of oxygen in air, compared with water, could provide the initial stimulus towards air-breathing ability. Probably deoxygenation of environment accounted for the initial evolution of the lung in ancestral Osteichthyes. With the removal of this stress other selection pressures probably favoured return to solely aquatic respiration (e.g. the obvious inconvenience of dependence on visiting the surface in many cases), and subsequent loss of the lung or conversion to other functions. In Neoceratodus it would seem probable that any selection pressures favouring loss of the respiratory function of the lung were more than equalled by the advantage of access to the atmosphere. The easy availability of oxygen in the atmosphere in a medium one eight-hundredth the density of water would provide a considerable energy saving to the fish for it is saved the necessity of using a lot of energy to pump water over the gills. This advantage could probably provide selection pressure favouring maintenance of the functional lung.

(5) Data on Angling Success and Seasonal Distribution of Catch
for Lake Eucumbene (1959 to 1963) on the basis of
Angling Licence Returns

by R. S. Bucknell
Fisheries Branch, Chief Secretary's Department,
Sydney, N. S. W.

Data on angling conditions in Lake Eucumbene were presented in terms of four indices:

1. Catch per effort, as number of fish caught per hour's fishing
2. Percentage of fishing trips that were successful
3. Average weight of fish taken, and
4. Percentage of brown trout in the mixed catch of brown and rainbow trout.

Values for these quantities had been calculated for each of the four eight-month seasons 1959-1960 to 1962-1963, and for each of the four two-month periods (September-October, November-December, etc.), over the seasons considered collectively (Tables 1-4).

Table 1
Catch per Effort
(as numbers of fish caught per hour)

	<u>Brown</u>	<u>Rain- bow</u>	<u>Com- bined</u>		<u>Brown</u>	<u>Rain- bow</u>	<u>Com- bined</u>
1959-60	.19	.27	.39	Sept. -Oct.	.13	.19	.36
1960-61	.09	.19	.28	Nov. -Dec.	.04	.25	.35
1961-62	.08	.24	.36	Jan. -Feb.	.06	.18	.25
1962-63	.06	.25	.34	Mar. -Apr.	.06	.30	.38

Table 2
Percentage of fishing trips that were successful

1959-60	73%	Sept. -Oct.	74%
1960-61	60%	Nov. -Dec.	76%
1961-62	73%	Jan. -Feb.	52%
1962-63	69%	Mar. -Apr.	71%

Table 3
Average weight of fish taken (pounds)

	<u>Brown</u>	<u>Rainbow</u>		<u>Brown</u>	<u>Rainbow</u>
1959-60	4.4	2.5	Sept. -Oct.	4.4	3.0
1960-61	3.8	2.9	Nov. -Dec.	3.5	2.6
1961-62	3.9	2.7	Jan. -Feb.	3.5	2.8
1962-63	4.0	3.0	Mar. -Apr.	4.2	2.7

Table 4
Percentage of brown trout in the catch

1959-60	29%	Sept. -Oct.	40%
1960-61	33%	Nov. -Dec.	13%
1961-62	20%	Jan. -Feb.	22%
1962-63	20%	Mar. -Apr.	14%

The season 1959-1960 was shown to have provided the best angling with the highest values for catch per effort and for percentage of successful trips. The following season (1960-1961) was the poorest. No conclusions could be drawn as to trends in average weights of fish over the four seasons considered. The percentage of brown trout in the mixed catch was shown to have declined.

Considering the four two-month periods over the four seasons together, it was shown that angling was poorest in January-February and roughly equal in quality in the remaining three two-month periods. The percentage of brown trout in the catch was shown to be markedly higher in September-October than in the other three periods.

(6) Comparison of Weight/Length Ratios between Murray Cod
from the Murray and Darling River Systems

by N. E. Milward,
Zoology Dept., University of Queensland,
Brisbane, Qld.

Measurements of total weights and total lengths of Murray Cod indicate that for fish of the same length those from the Murray System are heavier than those from the Darling System. The order of the dif-

ferences over a range of sizes are as follows:

	40 cm	50 cm	60 cm	70 cm	80 cm	90 cm
Murray	0.9 kg	2.0 kg	4.1 kg	6.7 kg	9.9 kg	14.1 kg
Darling	0.7 kg	1.6 kg	3.2 kg	5.4 kg	8.1 kg	11.7 kg

The causes of the differences are unknown. Analyses of stomach contents show that the types of food utilized by Murray Cod are similar in both river systems; yabbies, prawns, and fish constituting the main bulk of the food. It is interesting to note, however, that the fish prey in the Darling System are mostly native species (bony bream, golden perch), whereas in the Murray System they are introduced species (English perch, carp).

(7) Water Treatment Problems of Interest to Limnologists

by M.A. Simmonds,
82, Central Avenue, St. Lucia,
Brisbane, Qld.

I propose to describe some of the problems associated with the various treatment processes used for the purification of public water supplies.

Perhaps the commonest forms of trouble for the treatment plant operator is associated with the presence of algae.

It is usually assumed that a well aerated supply provides the best quality water for domestic use because organic material is oxidised and iron is precipitated. Algae produce a surplus of oxygen and therefore the presence of some algal populations can be beneficial. It is not unusual for the surface water to become super-saturated with dissolved oxygen as the result of algal activity. Unfortunately, oxygen also promotes corrosion and the amount of corrosion that can occur is proportional to the total amount of oxygen available. Therefore a super-saturated water will be strongly corrosive and additional treatment may be required.

In addition, algae raise the pH of the water. Values over 8.5 are common and, under suitable conditions, can exceed 9.0. If the

pH value rises high enough the water will reach the point of saturation with respect to calcium carbonate and this will be precipitated. It is sometimes claimed that this precipitated calcium carbonate forms a film on the pipe wall which inhibits corrosion.

There is another aspect to be considered which has a bearing on the problem of costs. In the treatment of water with aluminium sulphate for the removal of colour and turbidity there is an optimum pH value which must be achieved for the best coagulation of the coloured colloids. For example, the pH value of the untreated water may have to be reduced from 7.0 to 6.0 to achieve coagulation. In a well buffered water this may require large doses of "alum". If the pH value is raised from 7 to 8 by the activity of algae a considerable increase in the quantity of "alum" will be required to reduce the pH value back to 6.0 for coagulation. In addition, the fact that pH varies diurnally makes it much more difficult for the plant operator to control his chemical treatment.

I recently investigated a treatment plant where algae were responsible for another form of trouble. The water was drawn from a small surface storage. The surface water had a pH value of 8.65 and was 120 percent saturated with dissolved oxygen. At 15 feet below the surface the pH value was 7.4 and dissolved oxygen was absent. The complaint received was that the "alum floc" would not settle. Large "clumps" of floc were found floating throughout the sedimentation basin. The average size would be about one-half an inch across. The surface water was found to contain large numbers of a filamentous algae which were identified as Oedogonium. The long filaments apparently enmeshed the floc particles and enabled large clumps to be formed. The oxygen produced by the algae was trapped within these clumps, making them very buoyant. The only alternative was to use the lower water with the possibility of trouble in iron removal and sulphide odours.

A bloom of Oscillatoria in Lake Kurwongba produced a different effect. Here the settled water appeared to be perfect but there was a large carryover of algae which rapidly choked the filters. This plant was fortunate in having an alternative river supply which, although turbid, proved to be much more amenable to treatment.

It is interesting to note how, in a small area of south-east Queensland, we have a number of impounded waters, each of which has its own particular dominating algal species, e.g. Oedogonium at Beaudesert, Oscillatoria princeps in Lake Kurwongba and Microcystis in Lake Manchester.

Many of the public water supplies of Queensland contain appreciable concentrations of bicarbonate alkalinity. This, in conjunction with our intense sunshine and higher temperatures, produce far more prolific growths of algae than in the southern states. It is impossible to store a high alkalinity water in an open tank, and most clear water storage tanks are roofed.

Very low alkalinity waters do not support algal growths. For example, the waters of Cairns and Townsville are stored in open reservoirs without trouble even at the very high temperatures prevailing in these northern towns. However, there was one occasion when a very prolific growth did occur. Enquiry revealed the fact that it was in a new concrete reservoir filled for the first time. After draining and hosing down to remove the alkalinity produced from the free lime in the concrete, the reservoir was refilled and no further trouble occurred.

In a treatment plant the use of aluminium sulphate for coagulation releases carbon dioxide which stimulates the growth of algae on sedimentation basins and open filters require regular and frequent maintenance to remove algal growths.

In the shallower reservoirs the rooted aquatic plants can become a nuisance because they are difficult to control and if their growth is allowed to continue the volume occupied represents a considerable proportion of the total storage. Their decomposition removes oxygen from the system.

Now a few items for those interested in reservoir stratification. It has been found that in many of our smaller storage reservoirs the thermocline occurs very close to the surface. Five to seven feet below the surface is common and observations have shown that stagnation commences almost at the surface in some cases. These occurred in central Queensland where very high day temperatures were followed by hot nights. The rapid changes which occur are shown in Table 1.

Table 1

	A	B	C		
	Temp. Deg. F	Temp. Deg. F	Dissd. Oxygen p. p. m.	Temp. Deg. F	Dissd. Oxygen p. p. m.
Surface	90	75	3.5	88	6.5
2 feet	-	72.5	2.5	74	3.0
3 feet	77	-	-	-	-
4 feet	-	67	Nil	68	Nil
7 feet	-	-	-	63	Nil
17 feet	66	-	-	-	-

Theoretically a temperature difference of 2.5°F is sufficient to prevent circulation. Thus in A and C (Table 1) the thermocline must be very close to the surface. In B it is only a little over two feet below the surface.

This almost complete stagnation has a very bad effect upon the quality of the water. Dissolved oxygen is depleted, iron is dissolved and sulphide odours are produced. Note that dissolved oxygen was absent below about three feet and even the surface water was less than 50% saturated. This creates problems in treatment because a low pH value is required for the removal of colour and turbidity, but a high pH value is necessary to oxidise and precipitate the iron.

These conditions are liable to occur every summer in most of our central and western streams. This raises a question which has always puzzled me. Where do the fish go when there is virtually no oxygen available?

(8) Phytoplankton Variation in the Inflow, Stored and Outflow Waters
of Prospect Reservoir

by D. Cannon,
Metropolitan Water, Sewerage and Drainage Board,
Sydney, N. S. W.

Prospect Reservoir provides the nucleus of the Sydney Metropolitan Water Supply. Water entering by two main inflows and leaving by three main offtakes. Both inflows originate in other reservoirs, these reservoirs being for the most part unproductive to algae. The stored and outflow waters of Prospect Reservoir, although containing the same basic organisms which enter by one or other of the inflows, show a considerable increase in algal density. Increases which at times reach in excess of 1,500% with a mean over a twelve-month period of 630%.

The cause of this increase is virtually unknown. Depending on supply demands water retention in Prospect varies from one to three weeks. A possible cause given was the morphology of Prospect, being for the most part shallow, with an embayed margin and also greatly affected by wind, keeping available nutrients in circulation.

Members of the audience were asked for their explanation of the upsurge of algal growth.

A table showing phytoplanktonic species which had been identified, and a graph showing seasonal variation in phytoplankton density, were distributed.

VISIT TO AUSTRALIA BY PROFESSOR E.S. AND
DR. GEORGIANA B. DEEVEY

Many linologists in the eastern half of Australia were fortunate enough to meet Professor E. Deevey and his wife, Dr. Georgiana Deevey, during their recent (late March-early April) visit to main centres. Their tour took them to Canberra, Sydney (including Cronulla), Brisbane, Green Island (off Cairns), Melbourne, Mount Gambier, Adelaide, and Hobart. Their visit was a rather rushed one, and they were able to stay for only a few days to a week at each place. Nevertheless, Professor Deevey found time to deliver two or three lectures at each of several Universities, and these were greatly

appreciated, not only by limnologists, but also a wide range of biologists. In addition the Deeveys went on collecting excursions (to obtain Bosmina and chydorid cladocera) during their stay in Canberra, Melbourne, and Hobart. This Australian visit constituted a brief and busy interlude to their much longer stay at Christchurch, New Zealand.

VISIT OF PROFESSOR AND MRS. E.S. DEEVEY
TO NEW ZEALAND

by Vida M. Stout,
Department of Zoology, University of Canterbury,
Christchurch, New Zealand.

Professor and Mrs. (Dr.) E.S. Deevey, of Yale University, visited New Zealand on a National Science Foundation fellowship from October 1964 until May 1965. They took up residence in the Zoology department of the University of Canterbury and from there explored much of the country. Professor Deevey is well known for his work in palaeolimnology, the interpretation of the past history of lakes from studies of cores of their bottom mud. The main object of their visit was to obtain a number of cores from the bottom of New Zealand lakes and a Livingstone piston borer was brought into the country for this purpose. Some time was spent in exploration to find the most suitable lakes which should be, for example, not too deep, not too exposed to wind and with not too high a proportion of inorganic matter in their sediment. Eventually borings were made into the mud of four lakes in different parts of the South Island.

An essential part of their visit was a journey to the swamp at Pyramid Valley containing remains of moas. Several years ago Professor Deevey worked on a series of short cores taken from this swamp and was looking forward to obtaining a further, more extensive series of samples. A re-opening of the excavations was therefore arranged by the Canterbury Museum and a dig undertaken, resulting in the recovery of several moa skeletons. This dig went deeper than previous ones and Professor Deevey was able to obtain a detailed series of samples.

During their stay in New Zealand, Professor and Mrs. Deevey took part in a number of general limnological surveys of South Island lakes. They also collected from various parts of the country in

order to obtain a representative sample of the present day lake fauna for use in interpreting the fossil remains in the mud cores. Certain groups fossilize much better than others: among the best preserved are the chydorid cladocera and members of the genus Bosmina - these groups are therefore the special study of both Professor and Mrs. Deevey. Mrs. Deevey has been investigating seasonal changes in the Bosmina population of a New England lake; while in New Zealand she measured several Bosmina populations, including collections extending over a year or more. Mrs. Deevey's work has been principally concerned with marine zooplankton and, in particular, seasonal changes in length of copepods. She therefore took advantage of collections made for a doctoral thesis on marine plankton at present being undertaken in this department, and made seasonal measurements on several species of marine copepods.

Professor Deevey gave a number of lectures and seminars covering some of the wide variety of topics in which he is interested. These include the chemistry of lakes, in particular work with carbon and sulphur isotopes; and the ancient history of Mexico, in which he became interested while working there in limnology and palaeolimnology. Both Professor and Mrs. Deevey had a stimulating influence on those whom they met in New Zealand and we count ourselves indeed fortunate to have had a visit from them.

PAPERS PUBLISHED ON AUSTRALIAN AND
NEW ZEALAND LIMNOLOGICAL TOPICS
(A) DURING 1963 (cont.)

52. Bayly, I. A. E. Nature, Lond., 200, 704-705. Reversed diurnal vertical migration of planktonic Crustacea in inland waters of low hydrogen ion concentration.
- 52(a) Bayly, I. A. E. Crustaceana, 5, 75-80. Parasitic castration of a freshwater calanoid copepod by a cestode cysticercoid stage.
53. Barber, H. G. J. Quekett. Micr. Cl., 29, 193-195. Fossil freshwater diatoms from a deposit on the Harper River, South Island, New Zealand.
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A.S.L. Reprint Collection

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LETTERS

The following note has been received from Mr. Brian Timms who is working on the planktonic Crustacea of the University Pond at Brisbane:

"Mr. Smirnov in Russia is anxious to have specimens of Chydoridae (Cladocera) from Australia. He is at present working on the taxonomy of this family and intends to do a revision of the world fauna of Chydoridae. He is also willing to identify Chydoridae from the Australian region, and my experience has shown that he does this without undue delay. His address is: N.N. Smirnov, Biological Institute for Inland Waters, Borok, Nekouzsky rayon, Yaroslavskaya oblast, U.S.S.R."

NEWS AND VIEWS

Overseas Departures. Jim Bishop (Sydney) and Gordon Grigg (Brisbane) will both depart shortly for overseas.

Jim will fly to the U.K. on September 13th. For the next two years he will be working in Professor Sheppard's department at Liverpool University on a freshwater topic.

Gordon, with his recently acquired wife, Janet, is heading for the States where he will further his studies on fish physiology and ecology at Oregon University. Here he will be working with Dr. R. Morris who stimulated Gordon's interest in respirometry techniques during his visit to Brisbane in 1963.

We wish Jim and Gordon the best of luck with their studies, and hope that they will return in the not too distant future to strike a few blows for Australian Limnology.

Despite being bitten three times by a snake, Bill Williams eventually returned safely from his recent epic trip to the Kimberleys with numerous crustacean collections and water samples.

Ken McKenzie, who holds the first Shell Scholarship at Monash University, has been successfully "corrupted" into undertaking limnological work. He has already completed a paper on the Ostracods collected by Bill Williams during the Kimberleys expedition.

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